

Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Previously Presented) A method of detecting a position of a rotation axis of a suction nozzle of an electric-component mounting apparatus, the suction nozzle holding, by suction, an electric component, and being rotated about the rotation axis thereof to rotate the electric component held thereby, so that the electric component rotated is mounted on a component-mounting surface of a circuit substrate, comprising:

detecting, on a position-detecting plane including the component-mounting surface of the circuit substrate, the position of the rotation axis of the suction nozzle, wherein the position-detecting plane is co-planar with the component-mounting surface of the circuit substrate.

2. (Original) A method according to claim 1, wherein the step of detecting the position comprises

lowering the suction nozzle taking a substantially vertical posture, to position the suction nozzle at an image-taking position where a lower end surface of the suction nozzle is substantially level with the component-mounting surface of the circuit substrate,

taking, with an image-taking device, a first image of the lower end surface of the suction nozzle positioned at the image-taking position,

rotating, at least one time, the suction nozzle about the rotation axis thereof by a predetermined angle,

taking, with the image-taking device, a second image of the lower end surface of the suction nozzle rotated by the predetermined angle, and

processing the first image and the second image, to determine the position of the rotation axis of the suction nozzle.

3. (Previously Presented) A method according to claim 1, wherein the step of detecting the position comprises:

preparing a calibration member having, substantially on the position-detecting plane, a support surface and at least one first positioning reference,

placing, on the support surface, a calibration gauge having at least one second positioning reference,

taking, with an image-taking device, a first image of the first positioning reference and the second positioning reference,

holding, with the suction nozzle, the calibration gauge to move the gauge off the support surface,

rotating the suction nozzle holding the calibration gauge, about the rotation axis of the nozzle, to rotate the gauge by a predetermined angle,

placing, with the suction nozzle, the calibration gauge rotated by the predetermined angle, on the support surface,

taking, with the image-taking device, a second image of the first positioning reference and the second positioning reference, and

processing the first image and the second image, to determine a relative position between a reference point of the calibration member and the position of the rotation axis of the suction nozzle.

4. (Previously Presented) A method according to claim 3, wherein the step of detecting the position comprises repeating, at least one more time, the step of holding the calibration gauge, the step of rotating the suction nozzle, the step of placing the calibration gauge, and the step of taking the second image, and wherein the step of processing the first and second images comprises processing the first image and at least two second images to

determine the relative position between the reference point of the calibration member and the position of the rotation axis of the suction nozzle.

5. (Previously Presented) A method of detecting a position of a rotation axis of a suction nozzle of an electric-component mounting apparatus, the suction nozzle holding, by suction, an electric component, the mounting apparatus including a fiducial-mark- image taking device that takes an image of at least one fiducial mark provided on a circuit substrate, determining, based on the taken image, a position of the circuit substrate, moving, according to the determined position, the suction nozzle holding the electric component, and rotating the suction nozzle about the rotation axis thereof to rotate the electric component to a predetermined angular position, so that the electric component taking the predetermined angular position is mounted at a predetermined position on a component-mounting surface of the circuit substrate, the method comprising the steps of:

preparing a calibration member having a support surface parallel to the component-mounting surface, and having at least one first positioning reference,

placing, on the support surface, a calibration gauge having at least one second positioning reference,

taking, with the fiducial-mark-image taking device, a first image of the first positioning reference and the second positioning reference,

holding, with the suction nozzle, the calibration gauge to move the gauge off the support surface,

rotating the suction nozzle holding the calibration gauge, about the rotation axis of the nozzle, to rotate the gauge by a predetermined angle,

placing, with the suction nozzle, the calibration gauge rotated by the predetermined angle, on the support surface,

taking, with the fiducial-mark-image taking device, a second image of the first positioning reference and the second positioning reference, and

processing the first image and the second image, to determine a relative position between a reference point of the calibration member and the position of the rotation axis of the suction nozzle.

6. (Previously Presented) A method according to claim 5, further comprising repeating, at least one more time, the step of holding the calibration gauge, the step of rotating the suction nozzle, the step of placing the calibration gauge, and the step of taking the second image, and wherein the step of processing the first and second images comprises processing the first image and at least two second images to determine the relative position between the reference point of the calibration member and the position of the rotation axis of the suction nozzle.

7. (Original) A method according to claim 6, wherein at least one of the calibration member and the calibration gauge has a plurality of reference marks which are provided in a surface thereof and which provide a corresponding one of said at least one first positioning reference and said at least one second positioning reference.

8. (Original) A method according to claim 7, wherein the calibration gauge has a plurality of reference holes which are formed through a thickness thereof and which provide the plurality of reference marks.

9. (Original) A method according to claim 7, wherein the calibration gauge has at least two groups of reference marks including a first group of reference marks that are distant from each other by a first distance, and a second group of reference marks which are distant from each other by a second distance different from the first distance.

10. (Original) A method according to claim 7, wherein the calibration member has an upper surface level with an upper surface of the calibration gauge, and has the plurality of reference marks on the upper surface thereof.

11. (Previously Presented) A method according to claim 5, further comprising a step of applying a negative pressure to the calibration gauge placed on the calibration member.

12. (Currently Amended) A method according to claim 5, further comprising steps of:

taking, with ~~a~~the fiducial-mark-image taking device, an image of the first positioning reference of the calibration member, and

determining, based on the taken image of the first positioning reference, an error of a relative position between the fiducial-mark-image taking device and the calibration member.

13-21. (Canceled).

22. (New) A method of detecting a position of a rotation axis of a suction nozzle of an electric-component mounting apparatus, a free end of the suction nozzle holding, by suction, an electric component, the suction nozzle being rotated about the rotation axis thereof to rotate the electric component held thereby, so that the electric component rotated is mounted on a component-mounting surface of a circuit substrate, comprising:

rotating the suction nozzle about the rotation axis thereof by a predetermined angle,

positioning, before and after the suction nozzle is rotated about the rotation axis thereof, the suction nozzle such that the free end thereof is positioned substantially on a position-detecting plane which is co-planar with the component-mounting surface of the circuit substrate, and

detecting, on the position-detecting plane, the position of the rotation axis of the suction nozzle, by utilizing the rotating and positioning of the suction nozzle.